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Contents

Page

5 The Use of Operational Research and Systems Analysis in Government Decision-making
Sir Peter Baldwin, KCB

20 Solving VAT Filing Problems
R. Townend and R. A. Waskett

27 Making the Best Use of Your Human Resources
W. A. R. Wolfe

30 Management Accounting in the Civil Service
M. L. Taylor

33 Management Consultants in Government

37 Networks for the Blind
F. Offler

39 Professional Accountancy Training in the Civil Service
D. Jamieson

42 Audio Cassettes for the Manager's Bookshelf
Mrs. B. M. Howard

47 A Handbook of Personnel Management Practice—A Review

49 Letters to the Editor

52 Computer Installations for Government Departments

The Use of Operational Research and Systems Analysis in Government Decision-making

SIR PETER BALDWIN, KCB

Sir Peter Baldwin is Permanent Secretary of the Department of Transport. The following article is based on a paper he presented on behalf of the Civil Service at a discussion meeting of the Royal Society. The full proceedings of the meeting have been published by the Royal Society in Issue 1346 of *Philosophical Transactions*, Series A, and we are grateful to the Royal Society for agreeing to our publishing this adaptation. —*Editor.*

Introduction

Whenever I hear it I marvel at the phrase 'decision-making'. It offers itself for conjugation thus: I decision-make; you decision-make; he, she or it (if we have a committee) decision-makes. It has taken 20th-century man to invent it, as a description of a scientific mystery behind the closed doors of the Board Room, the Cabinet Room or the Kremlin. Yet there is a simple English word for the same process. That word is 'to decide', which the *Pocket Oxford Dictionary* defines as 'to bring or come to a resolution to *do*, on or for or against *doing* . . .'.

The theme of this article, therefore, is how operational research and systems analysis may help people in government to bring or come to resolutions on or for or against doing something. These people actually have to decide what they will do. Their problem is very often the complexity of causes and effects which will be associated with anything done, or not done. Much intended help adds to the complexity. Alexander Pope put the cry from the heart of those in government very well when he wrote:

> Who shall decide, when doctors disagree,
> And soundest casuists doubt, like you and me?
>
> *Moral Essays*, Epistle 3, lines 1 and 2.

What I have to say is not of any personal discovery of mine, but of growing realization that the rigour of mathematical thought can help people in government to comprehend before they decide—and help them in many more ways and to a greater extent than they might expect. In trying to unfold this growing realization I shall be drawing selectively on experience within the whole Civil Service, and on the personal achievements of colleagues within the Service who have been,

or are, practitioners of operational research or experts in systems analysis, and of those outside the Service with whom they have worked or from whom they have learned.

In speaking of 'growing realization', I imply both that realization has been growing for quite a long time and that it has a long way to grow. It is, however, both fair and important to acknowledge at the beginning that the development of computers has greatly extended the possibility, within practical time limits, of exploring by modelling methods the complexities of apparent causes and effects which occur in much of the field of action with which government is concerned. For this reason much that has happened in recent years in the application of OR could not have happened much earlier. On the other hand, the back of an envelope has always been, and will remain, one of the most useful instruments of OR. Whether we need a computer or the back of an envelope for the job in hand, the main form of question with which government needs help is, 'What would happen if . . .?'

Issues for OR in government

This is a question with which government is or ought to be greatly concerned. If it can be answered sufficiently well, it may lead to the capacity to decide which of many things that 'would happen if . . .' would be the best result. This in some sense is what good government is about, what good government decisions are and what good government policy is. The special contribution of OR seems to me to be as representing rigorous effort to raise and answer questions in the form 'what would happen if . . .' where there is reasonable ground for expecting it to be worth posing that question, or several such questions related together.

The form of the question will, however, leave many groping after its meaning unless it is elaborated: 'If what?' If several things: first, if the situation in which action (or inaction) is to be decided is as it is believed to be—or not; second, if there are, or are assumed to be, particular limits, for example, of money or manpower, on the possibilities of action; third, if there are believed or assumed to be certain probable or inevitable consequences (e.g. a strike) of particular possible lines of action; fourth, if there are results of a particular kind which it is desired to achieve, for example, some reduction in the prospective average number of prisoners per cell; and so on. In short, 'if' stands for variables in the assumed situation and in the intended outcome of action; and in principle it looks as if variables in the real world and their significant relationships are suitable for expression as such in the form of a model.

But they may not be expressible as readily as all that. There may, for example, be little or no statistical evidence of the probable extent of a particular possible variation in the assumed situation; or nothing but professional or political judgement to specify the result, or alter-

native results, which it may be desired to achieve. In such situations, as indeed in most of his activity, the operational researcher will seek guidance from his colleagues, administrative or professional (or both) as the case may be, who are concerned directly with the problem which he is trying to illuminate. He will seek to express in formal terms what he learns from them, without, however, accepting such constraints that his work will do no more than reflect prejudgements of theirs.

His colleagues, however, have a problem in recognizing when he may be able to help them. So far as I know, no one has yet attempted to publish an exhaustive statement of the criteria by which someone not expert in OR can spot its opportunity.

These two difficulties are obstacles in the path of predicting how widely the approach may be applied to government business. In the face of them OR has penetrated government business up to now on the basis of 'try and see'. The rest of this article will mainly describe selectively where the Service has tried, and what it has seen, by these methods; and will attempt to draw some inferences.

Origins of OR in civil government, and early post-war developments

The history is not a simple biography of OR. It is rather like one imagines the beginning of agriculture to have been: seed grew here and there, and their fruit was good; and the seed of that fruit began to be sown systematically, and where the ground and seed suited each other, the harvest came. The usual thumbnail sketch of the history of OR in government is that the seed flourished in defence before and during the Second World War; and that it was blown about after the war and took root in the civil departments. But the truth is not as simple as that. In the first place, the roots in pre-war days went a little wider. They can be dug up, for example, in the concern of the Home Office with air-raid precautions, which developed later into guidance supporting our own air offensive and later still our defences in the day of the cold war.

At the end of the Second World War a report of the Advisory Council on Scientific Policy recommended that, since OR had been so successful during the war, its use should be confirmed in peace time by the appointment of scientific advisers to the major departments. It would be their task to promote the use of OR and scientific methods generally in the solution of the problems brought by peace. These appointments confirmed the existence of the Home Office group and one subsequently set up in the then Board of Trade; and as a result of this initiative, a group was set up in the former Ministry of Works. The Trade group joined the Department of Scientific and Industrial Research (DSIR) whose task was to promote OR in industry rather than government, but a civil aviation OR group remained in Trade, and ultimately became the OR unit of the Civil Aviation Authority. But progress was

not impressive. Most of the leading exponents of war-time OR had returned to their universities and original scientific disciplines.

The DSIR group began life in 1952 in response to the nobly intelligent concept of the Marshall Plan of economic aid from the United States. The group set up the Industrial Operations Unit which was thus known by the reproachful but expectant initials of those words. It worked mainly through research and trade associations, with emphasis on appreciation courses and other means of education. The diversity of subjects was astonishing. It included projects relating to doctors' group practices, the production of concrete, economic planning of secondary schools, bottling, quarries, the baking, central heating, timber, sawmill, cotton, hotel, carpet, rubber, printing and clothing industries, the blood transfusion service and, as if all else failed, the organization of cemeteries. DSIR should have the credit for another initiative. The Royal Institute of Public Administration set up a unit in 1959, with a grant from DSIR, to promote the use of OR in local government. The former Ministry of Housing and Local Government also received some help from this unit.

But in the 1950s such other OR work as was being done in the civil departments was mostly part of the work of assessment, statistics and economic groups carrying out their normal advisory roles. We are still looking, therefore, for what could be recognized as a programme of operational research or a concentrated effort in the civil sphere of government.

The beginnings of an upsurge occurred, however, in 1962 following recommendations of a Royal Commission on the Police Service, who thought that there should be a central research facility to help police forces develop their methods and equipment; this was formed in 1963. Here, the posting of the senior staff applied experience of OR in defence to peace-time operational situations with characteristics similar to those encountered in war. One of its most valuable results has been the design and installation of computer-based control rooms in major police forces, which bring together the technology of communications and information display, and the power of computers for information storage, reference and analysis.

The same strain of thought has fed the thinking of the Home Office about fire, through the Scientific Advisory Branch. Economic study of the losses which fires cause and of fire casualties is in hand to guide legislation and publicity. A functional analysis of local authority expenditure on fire services, and the time spent by firemen and fire prevention staff on their various main activities, is in hand to show what a fire service should consist of and how it should be organized. Conclusions on the number of appliances for a brigade area, and their best deployment, using cost-effectiveness criteria, are being tested in a group of brigades; and they look good. And so on to development of models of fire growth and possible fire-fighting tactics, with the saving of life as the prize.

Concerted development in civil OR

But what of more concerted effort? Back again for this to the Plowden Report on the Control of Public Expenditure which appeared in 1961. Paragraph 53 said:

> In general we believe that there should be active consideration of the wider application of quantitative techniques both to policy and to management: there is no simple or straightforward method of strengthening Whitehall here, and there is an acute shortage of professional statisticians and other experts of this kind; nor is there any one specific type of professional work or of skill appropriate for all kinds of quantitative work. Experiment is likely to be necessary, and the civil departments will have to build up their own expertise just as the Service departments have done in operational research.

Having immediately set up the Plowden system of medium-term planning and tackled the statistical problems which this involved, the Treasury in 1965 introduced the nucleus of an OR team into its advisory O & M Division. By 1968 this had grown to a full Division, operating alongside O & M. The Division set about establishing its relationships with departments, encouraging co-operation in studies which crossed departmental boundaries, giving or securing professional advice, and carrying out studies of its own, though not yet of great significance for policy in the civil world.

There followed, in June 1968, the Fulton Report and the division of CSD from the Treasury. Thus the new OR Division found itself in the new department. Among the Fulton recommendations was further emphasis on the need to use numerical methods and modern management techniques in government. This led to a review of the extent to which such techniques were already in use and where they needed to be either introduced or reinforced.

In January 1969 Sir William (now Lord) Armstrong, then Head of the Civil Service and Permanent Secretary of CSD, led a seminar at Nuffield College, Oxford, at which possible developments in this field were discussed by a galaxy of Ministers, officials, academics and practitioners. The object was to clarify what OR could do for government if more of it were done, where, if anywhere, it should be placed in government and how it should be organized.

The papers presented at that seminar covered the subjects in vogue: operational analysis, cybernetics, econometrics, systems engineering, systems analysis, total systems analysis and so on. Defence Operational Analysis Establishment (DOAE) at West Byfleet contributed a paper which made the point that too often the work was *ad hoc*. Whether the question was posed by the Minister or arose in the course of the operational work of the department, problems were usually of the moment, to be answered to a date-line. On the other hand, DOAE was concerned that each of the studies it undertook added to the sum total of its detailed and structured understanding of defence, so that as time went on problems would be solved less and less in isolation and more

and more in perspective with the total aim of defence. Increasingly OR in defence, and in particular the work of DOAE, was becoming applied to aiding decisions on allocation of major resources between competing claims and formulating long-term strategy and policies. This process, involving decisions and interactions between political, military and scientific judgement, could be supported to an increasing extent by analytical methods which expressed numerically the merits of alternative choices, examined the sensitivity of input assumptions and drew attention to the critical issues.

The seminar recognized that the problems which OR would be asked to solve in peace time would on the whole be harder than those facing it in war. If you are trying to find out how to minimize the opportunities for successful attacks on shipping by enemy submarines, or to destroy those submarines in the largest possible numbers, the goal is clear and the test of success is plain. In peace, even in, say, the industrial world, the goals and tests of success may not be so straightforward. The primary problem may be the reduction of inventories so that the money tied up in current assets is reduced and the return on total assets is increased. But if the resilience to industrial action in factories that make components depends on higher inventories, then management may think it unwise to plan to reduce them drastically. The industrial world throws up, indeed, many problems in which several objectives have to be weighed together. But at least there is a leading objective of long-term profitability behind which the others can usually be seen in perspective. In the civil sector of government, however, there is less probability that the goals will order themselves in this way. If there are objectives to be found, they are numerous, interacting and imprecise. They are likely themselves to be the subject of political debate.

Few, I think, at the seminar had any doubt that something should be done to extend the use of OR and its like in government, but it was clear that the great variation in the needs and problems of the civil departments made it difficult to make proposals in any general form. Nor had OR experience in government outside defence yet extended far enough into thinking about policy to show very clearly the direction to take. The end of this chapter—or was it the beginning of a new one?—was that a year after the Oxford seminar Sir William Armstrong recommended the following to Permanent Secretaries:

(*a*) Departments which already had small study groups should consider whether these could be integrated to provide a larger, more viable unit. Such a group should have close ties with the management services organization which should otherwise have an OR group of its own.

(*b*) Departments which had no study groups of mixed disciplines should review their organization to see whether one should be formed.

(*c*) Those departments which considered after review that it was not

practicable to form a group of their own, should be able to continue to draw upon CSD's OR Division to help with their problems.

(*d*) Departments should form joint study groups *ad hoc* when problems arose which crossed departmental boundaries. The CSD group should provide advice and help.

CSD's OR Division was to be built up to support these recommendations.

Relation to continuing departmental problems

As these first moves towards concerted application of OR in the civil sector began, the scene was one of widespread individual applications and developments. I have already mentioned some of those in the Home Office, but they were extending also to prison security and consumer safety. The then Ministry of Transport looked at the parking problems in cities; an independent inquiry team was concerned with the vexed problem of the siting of a third London airport; there were problems of the likely size and nature of air traffic; and many more.

But here and there among these studies, which were pointed to the problems of the day, were to be found studies of a different nature, which sought more general solutions which would be able to answer questions of tomorrow not yet posed. Department of Education and Science had embarked upon a model of the education system; the Forestry Commission was attempting a financial control model; and the former Ministry of Technology was building a computerized model of the energy sector of the economy. CSD had started studies in various fields of essentially on-going planning models concerned, for example, with pay structure and career planning. The logical inter-connection of CSD's own problems was being investigated, and a planning and control model for management of a small department was being structured.

A notable contribution in Defence was a successful study on the strategic movement of forces needed to reinforce and redeploy in times of tension in which, against a background of some eight scenarios involving movement of forces from the United Kingdom into Europe and elsewhere, various mixes of ships, aircraft and stockpiles were considered and their whole life costs estimated. The study entailed the development of a massive linear programme and the assembly of a large data bank. It resulted in a classical OR exercise in which various mixes of transport could be compared, and the sensitivities of the many assumptions tested. It provided the policy staffs with a reliable numerical basis for making judgements. There was an incentive to adopt a central and systematic approach to this problem, because it cut across all three Services, and decisions were made which affected the Services in different ways. The textbook nature of the mathematical part of the work is noteworthy because it is very unusual—applications of the techniques of OR which are taught in colleges are, I am assured, comparatively rare.

In spring 1970 DHSS introduced an OR unit for the first time. Its first task was to construct an on-going model for resource allocation across the whole of the health and social services resources. From the beginning it was seen as an adaptive model. One of the requirements was that it should be capable of being developed while at the same time it should help the department to solve some of its major problems of allocation in the short term. The model has now been made and is one means the department has of making quantified comparisons where more than one possible solution to a problem needs to be considered.

The Inferred Worth Model is specifically concerned with the way in which the development of services for one group of clients for services competes with those for another client group because of constraints on the overall availability of resources. It was conceived as an attempt to look across the Department's interdependent activities in health and personal social services in order to make it easier to say quickly what would happen if different policies were followed. The model represents not only the aggregate resources for the health and personal social services but also the consequences for patients, in terms of how many patients receive care, in what form and at what intensity, given changes in the total resources and their distribution. It does not attempt to settle policy decisions but only to illustrate their consequences, so that those who have to take the decisions can test successive assumptions. The model is now being used in DHSS, alongside other techniques, as an aid to their national planning. It is also being used as an integral part of the planning by an area health authority within the financial resources allocated to it, on a formula which again rests partly on work of the DHSS OR unit.

One can see in work of this kind the advent of a new dimension to OR work in the civil sector of government. This has begun to emerge from an era of *ad hoc* studies. The on-going generalized model is beginning to appear which is able to give continuing advice to the decision-maker.

There is another aspect of this. The human mind is well able to recognize human needs, goals, fears and prejudices, all of which should be (and, I think, generally are) taken into account by senior civil servants and politicians before coming to any particular decision. It is also remarkable in its ability to understand complexity, with an effort, and it can build models of the reality it perceives. But where the human mind is very bad is in tracing over a period the interplay of the many factors in these models to see what the very structure it has built will amount to when its components have interacted for some time. But a great number of our decisions require us to do just this. This is where I believe that OR may eventually make its greatest contribution, especially in conjunction with computers with their enormous capacity for memorizing and analysing data.

I shall now turn to an example of a specific departmental issue—formulating a subsidy policy for the bus industry. Subsidies were almost

non-existent a decade ago, but over the past few years have grown substantially. We have all seen the buses with more and more empty seats. Use of buses has been falling steadily for 20 years or more; it now stands at only half the level reached when bus travel was at its peak in the early 1950s. The main reasons for the decline are increasing car ownership (every new car results in 300 fewer bus journeys each year), higher fares and a poorer level of service (as operators attempt to make ends meet). Analysis of these trends and studies of actual fares and changes in the levels of service has produced numerical values for the main parameters affecting bus patronage, which has been used in models set up to explore the likely economic consequences of various subsidy policies. One such model, calibrated against survey data, investigated a zero fare scheme for London and includes Underground as well as bus travel. This indicated that by reducing boarding times, by eliminating ticket handling and by making one-man operation more widespread, a free-fares policy could produce community benefits through savings in time and operational costs. These, however, are not the only consequences of zero fares; experiments indicate that there is a good deal of switching from walking to public transport if travel is free, but very little switching from cars; simulation indicates that there might well be a shift of homes from the centres of cities to the suburbs, bringing escalating costs, while efficiency is likely to tend to fall off when normal commercial yardsticks are applied less vigorously. It might be argued that any increase in the cost to the public purse could be regarded as a transfer payment. But the public expenditure would be so substantial as to raise important questions at national level about the allocation of resources. On the question who pays and who benefits, free travel may not necessarily be progressive: it depends on the way the money is raised.

There we have a problem illuminated, if not identified, for the policy-maker, who is my Secretary of State and my Department. The problem is already exposed for public discussion in my Department's Consultation Document of March 1976.

Relation to continuing interdepartmental problems

Let me turn next to a much wider group of problems where, for the first time in this account, the mainspring of the development of OR was not exclusively the need of a department to discharge its own responsibilities: for example, the problem that departments share with the Treasury in the planning and control of public expenditure. The development of the system of information and the ministerial and, eventually, parliamentary processes of control since the end of the 1950s has been fully described elsewhere; the particular point of interest here is that the sources of information which were used were those that were already available at the time. The quality of the information had to be improved if it was to sustain the weight which was placed upon it by the new arrangements. In 1967 a Treasury team was given the task

of analysing particular respects in which existing information was deficient and securing the necessary improvement. Again, I can only illustrate the approach by examples of this work.

Finer accuracy was required in forecasting the big capital programmes controlled by government. Moreover, it had to be possible to understand, for example, what would really be happening on the ground from sources of information which expressed only the passage of money payments. The first task, therefore, was to construct a time series of information about all the projects making up a programme over a run of years, from the earliest conception that there should be such projects through their planning, design, tendering processes, their construction, measurement of work done, payments for work in progress and the final conclusion of all financial transactions relating to them. The team suggested systems for recording and analysing this information in relation to the school building programme of local authorities, and the road-building programme of central government. It was a task which would have been impracticable without computers of the capacity available at the time.

But this foundation of information was only the first step. Unfortunately the course of the British economy has not allowed a programme such as the roads programme to be settled five or ten years ahead and left to proceed in accordance with those decisions unchanged. On the contrary, those concerned with managing the programme have had to do so in rapidly changing circumstances, not only of uncertainty but of successive decisions to make massive reductions in planned expenditure. In such a situation, that 'what would happen if . . .' question comes up again and again. Management of the roads programme has rested heavily on mathematical modelling designed to enable the managers of the programme both to see the practical implications of changes in their plans on the scale required, and also to wring the maximum advantage from the programme as reduced. The Treasury and the Department (DOE) agreed that the feasibility of mathematical modelling for these purposes in relation to the road programme should be examined, and a team including OR staff was appointed in the Department who carried out a feasibility study in 1970. This resulted in recommendations for a computerized system with three main components: an accounting system for the roads vote, a data base of information on road schemes, and mathematical forecasting and planning models to assist the financial control function. The whole system has become operational during the past two or three years, but, of course, it has to be continually developed. The particular contribution of OR has been the models which systematically use data on past schemes and performance to provide more accurate forecasts of expenditure, and which use explicit methods of adjusting the start dates of road schemes so that resulting expenditure lies within the ceilings on expenditure determined by the Cabinet.

The OR staff who were appointed to DOE in 1970 went on second-

ment from the CSD team. Their contribution on the highways programme, however, was an opportunity created for them in part by the Treasury, who suggested that similar opportunities should be sought with other departments. To make this more straightforward, the Treasury and CSD agreed that several members of CSD's OR Division should be placed in the Treasury, so that they could help in two ways. First, when the Treasury felt there was a possibility of improving by OR methods the quality, for example, of the forecasting of some programme of expenditure undertaken by a department, they could introduce a competent practitioner to the department where such a man was not already available. This has been successfully achieved in several cases, and valuable work has been done in the Department of Industry, in conjunction with the Department's own OR group, on forecasting and control of expenditure on Regional Selective Assistance under the Industry Act 1972; in MAFF on capital grant schemes for farms; in ECGD on re-financing of export credits; and on legal aid administered by the Law Society. Second, the Treasury itself has made use of the OR team at their disposal; for example, to devise an improved model for forecasting the complex flow of payments of debt interest in the public sector.

Relation to local government expenditure

A further development of this kind of work occurred in 1974. Roughly two-thirds of all the current expenditure of local authorities is defrayed from Rate Support Grant which is paid and distributed by central government. In annual negotiations between central government and the associations of local authorities, forecasts are made of expenditure on each of the various individual services which local authorities administer. Since 1971 these forecasts have been provided by joint groups of officials from central and local government. But with the increasing size of local authorities' expenditure in relation to total public expenditure and national resources, and increasing concern to forecast it accurately in changing circumstances and under the influence of tightening constraints, even services previously regarded as very much at the discretion of local authorities now require to be more accurately quantified. The quantification has to take account of all the varying influences on expenditure, such as the flow of net new current expenditure from completion of capital works, changes in the responsibilities of local authorities, trends in demand for facilities and levels of charges. Following an initial study by the Treasury OR team their colleagues in DOE prepared a model covering local authorities' expenditure on recreation, parks and baths which was used in 1976 in a report to the Consultative Council in which the negotiations of Rate Support Grant, amongst other things, are now conducted between central government and representatives of the local authorities for England and Wales. Design is continuing of models for other services for which rigorous forecasting procedures have not previously existed. Improved fore-

casting is one condition of better decisions on public expenditure and of improved control.

If every one of our major expenditure programmes was covered by these sorts of facility, we should have a more effective system of planning and control. But it takes time to design and build these systems and to introduce them into the day-to-day business of departments. Although the specialist effort at any one time on any one system may be small, the number of systems that can be given this attention is limited. Hence, I think that the possibility of applying fairly standardized models to expenditure programmes (which smacks rather of 'looking for problems to fit our solution') is, nevertheless, something that should be examined very carefully if we are to get the sort of improvement for which we are looking.

Relation to central government expenditure

So far I have referred to financial processes in departments, but it is implicit in everything I have mentioned that the Treasury and CSD also need to be able to monitor what is going on so that they can assess the room for manoeuvre, to respond to the changing priorities of government and the economic pressures which require changes of policy. To monitor, we need information continuously, or, in the jargon, we need management information systems.

In the financial field, the largely virtuous system of delegating responsibility to individual departments, with the Treasury holding the reins at the centre, led to a proliferation of accounting and financial planning systems (and, if we are not careful, future computer-based systems) which were not compatible with each other and might not readily yield as much standardized information to the centre as we might need in the future. At the centre, too, we needed to take account of the developing powers of computers to give us a quicker reaction to events and a more informed look into the future. It seemed appropriate for OR people to develop these systems for us because the financial planning models they will be developing in departments and at the centre will have common needs for information and will be very much easier to build and more effective if they can be based upon a common system.

As with so much other operational research their study of central financial information needs and flows was multi-disciplinary, and leant heavily on management accountants and computer systems analysts. Administrators were also involved. In exchange, once the recommendations for new types of information and a new system to deal with it had been accepted, responsibility for setting it up was passed to an administratively based team, but this time specialists from the old team are assisting them.

I must not give the impression that the result of this central study has been to place a straightjacket around the accounting and financial planning systems in departments. Rather it has defined more precisely

the requirements placed on those departments from the centre. It has also highlighted some functions which for some small departments might be done more economically centrally. Finally, it clarifies the relationship between the various financial planning systems which have grown up over time in the Service, and which all have their special uses, but which require translation as if from one language to another.

Relation to world problems

Attempts have been made to apply OR methods to world problems. The concept of constructing models of the future state of the world, including the routes that lead from the present to those states, was introduced as a matter of quantitative technique by Professor Forrester in 1971. Forrester's pupil, Meadows, and his research team achieved prominence with the publication of *Limits to Growth* in 1972, which was also the year of the Stockholm Conference on the Environment. One of the United Kingdom responses to that conference, and to the attempts at modelling states of the world, was the establishment of the Systems Analysis Research Unit (SARU) in the Department of the Environment. This unit, working with other departments, still has the brief to examine and report on models like that which was published in *Limits to Growth*. It is also charged with the task of assessing the usefulness of such modelling methods as contributions to devising strategies for national and international political action to anticipate and to handle world problems.

There is certainly widespread disquiet about the possible future states of the world. World supplies of oil, world stocks of grain, world prices of raw materials and so on have become common terms. Periods of decades are now thought necessary and right for governmental action, nationally and internationally. We speak of 'the energy gap in the 1990s'. Can this kind of thinking be fully and coherently formulated so as to give the nations, individually and collectively, the best possible opportunity to handle these world problems when they arrive or as their seeds are sown?

Although I have posed that question, I do not intend to offer a definitive answer to it. It seems to me that we owe a great deal to pioneers such as Forrester and Meadows who have attempted modelling on a world scale, but that it would not be surprising if conclusions which may be suggested by work at their level of generalization were found to be apparently inconsistent with conclusions suggested by modelling of more limited prospective situations. This, indeed, seems to have happened already. For example, for the World Food Conference in 1975, SARU examined possible future levels of food consumption and production in India, Bangladesh and Pakistan which represent a significant part—probably the gravest part—of the problem of adequacy of future food supplies in the world. The importance of the model which they devised for this study is that it suggests that doom

of the sort prognosticated by Forrester and Meadows, arising from scarcity of raw materials, should be regarded as improbable. We have reason, therefore, by virtue of the work done so far, not to be stampeded into trying for a world strategy of 'no growth'. I do not suggest that the debate is thereby disposed of. I suggest only that it is likely to be worth while to continue to try to conduct the debate with the assistance of rigorous systems analysis, not taking too long about it. In a paper which the Cabinet Office published in 1976 entitled *Future World Trends*, one of the concluding paragraphs has this to say:

> Mathematical models will play an increasingly important part in the study of future world trends, particularly in the investigation of the interrelationships of the subject-areas discussed. The broad conclusions of separate more recent modelling studies have tended to converge, especially in pointing up the problems of distribution rather than global physical limitations. An all-inclusive world model to answer our questions is an inviting prospect, but more narrowly based exercises aimed at specific issues can be useful aids to policy-making.

Conclusions

I shall now offer some generalizations concerning the circumstances in which, prima facie, it may reasonably be expected that there will be a profitable opportunity to apply operational research or systems analysis to government business. The points to be made are all in qualification of the underlying question, 'What would happen if . . .?' I suggest that we should look for that question in combination with one or more of the following situations: there are complex issues of allocation of money, manpower, building, training places or other resources; there are complex interactions between different parts of a system; there is uncertainty embedded in the structure and nature of the problem itself.

It will not escape readers' notice that the emphasis in this list is on the practical consequences of policies. There seems to me to be a very great deal of work to be done on such practical questions, leaving aside the no doubt more interesting and philosophical questions about the aims of government and how they can be reconciled. In case you misunderstand me, I am not saying that OR has not been or cannot be applied to these questions, nor that its help would not be valuable, but access to them will usually be gained by showing a mastery of the practical consequences of policy, as a first step to better decisions.

From the practical work that we have seen in government, I can offer four conclusions:

(1) The vast majority of decisions made in government belong to continuous and established (but not immutable) processes. The most effective OR models will be woven into the fabric of these processes, so that they are used in the normal course of events.

(2) Although many of the situations which I have suggested are suitable for operational research are complex ones, it is, perhaps, paradoxically essential to keep the models as simple as possible. New

and more elegant ways of deciding can be introduced later, when specialists and non-specialists understand each other thoroughly.

(3) Be prepared for model building to be a long process. The first model built will almost certainly need adaptation to changing circumstances and quite possibly to the manager's changing understanding of what it can do for him. Continuous development and support is necessary.

(4) OR managers should be prepared to leave their bright young people behind to help to develop their models and, indeed, to assist in their everyday use. Although this may place a burden on recruiting, it will in the long run provide the exchange of experience that both sides need.

One final word: except by chance, a decision will only be a wise and conscientious one if it is taken by wise and conscientious people. So, back to Pope:

> Like doctors thus, when much dispute is passed,
> We find our tenets just the same at last.
>
> *Moral Essays*, Epistle 3, lines 15 and 16.

Editor's note

Readers may find it convenient to have a note of some of the articles on the application of operational research in government which have been published in MANAGEMENT SERVICES IN GOVERNMENT:

(1) 'Operational Research in the Planning of Employment Services in Large Cities', by N. F. McGlynn, MBE, M. F. Shutler and P. D. Saalmans, Volume 29, Number 4, November 1974 (11 pages).

(2) 'A System of Models for Planning Highways Expenditure', by Dr. K. Aldred and B. L. Glicksman, Volume 31, Number 1, February 1976 (9 pages).

(3) 'Peterhead Bay Harbour—An OR Study into Its Capacity for Tanker Traffic', by W. Russell, Volume 31, Number 2, May 1976 (7 pages).

(4) 'The Financial Information Systems Project', by F. E. R. Butler and Dr. K. Aldred, Volume 32, Number 2, May 1977 (10 pages).

The method for obtaining copies of these and other articles is given inside the title page.

Solving VAT Filing Problems

R. TOWNEND and R. A. WASKETT, Customs and Excise

Roy Townend is an SEO in the Management Services Division of Customs and Excise, and undertook the assignment on filing in the VAT Enforcement Division. Richard Waskett is an HEO in MS Division and has been involved in the implementation of the new filing system in local VAT offices. Acknowledgement is also due to Messrs J. H. Davies and D. F. Nudd who were joint assignment officers on the review of local VAT office filing. —*Editor.*

Introduction

In April 1973 Customs and Excise were faced with the task of introducing Value Added Tax. The scale of the problems involved can, perhaps, be appreciated when it is considered that the number of traders registered for VAT (1¼ million) is about 20 times the number registered under the superseded Purchase Tax system.

Collection of VAT is centralized, using a computer system located at Southend. This is supported by large clerically-based headquarters divisions which deal with collection work, enforcement, etc. In addition, local VAT offices (LVOs) have been established throughout the country to deal with control and enforcement work at traders' premises.

The planning team responsible for setting up procedures for the new tax was constrained by a tight timetable and was not armed with the advantages of hindsight. Even so, it is to its considerable credit that the tax was launched fairly smoothly and without serious mishaps. Inevitably, difficulties have arisen since implementation, but the management and staff with operational responsibilities have been very resourceful in developing and introducing improved procedures.

This article is concerned with the filing problems which arose in two separate areas, the Enforcement Division at headquarters and in local offices. Separate O & M assignments were sponsored simultaneously in both these areas in the latter part of 1975. The assignment officers involved benefited from an exchange of ideas, especially in the choice of suitable filing equipment.

Filing in Enforcement Division

Most traders are required to furnish returns and make payments quarterly; the remainder are those entitled to claim repayments on a regular basis and they are allowed to make monthly returns. If traders fail to pay at the due date reminders are issued and these may be followed by assessments, automatically prepared by the computer or manually completed depending on the circumstances. At a predetermined time in the cycle the computer system generates an Action Notice for each trader in default. This sets out the trader's accounting details so that follow-up action may be initiated by the headquarters

division responsible for enforcement. In many cases a notification is sent to the appropriate LVO for an approach to be made to the trader, and this may ultimately lead to distraint. After an Action Notice has been produced for a particular trader, further computer print-outs are generated whenever that trader's account is up-dated, so that Enforcement Division is kept informed of developments.

The work of Enforcement Division is split between a number of Process Units, each of which has responsibility for one or more LVOs. At the time of the assignment, two copies of the Action Notice were produced. One was used to set up a case file and the other was used as a reminder (BF) document. The BF copies were filed in BF date order in spring-clip filing boxes. The case papers were filed in clear plastics jackets, which were stored in registration number order in trays on shelves in standard filing cupboards. Each tray held about 60 case files and up to 24 trays could be stored in one cupboard.

Problems

The use of a copy Action Notice as a BF document created a major problem. Cases often involved default in several tax periods, resulting in the production of separate BF documents; these could be filed in different date locations. When action had to be taken it was necessary to find all the relevant BF documents and, likewise, after action, all the BF documents had to be refiled. This had created a paper chase. The filing task was made worse by the arduous work of lifting the filing trays from the cupboards, since each weighed an average of 12 lb when loaded with case files.

The system would have been practicable if the estimates of workload had been accurate. Unfortunately this was not the case, and backlogs of work arose due to understaffing. At the time of the assignment, a typical Process Unit had about 7,000 case files, requiring some 40 spring-clip boxes to contain the supporting BF documents. The filing activities on one unit alone were enough to employ two Clerical Assistants. Overall the Division had to devote considerable staff resources to the task of filing.

Improved BF system

A more efficient BF system was clearly essential. The copy Action Notices were A4 size and flimsy and not particularly suitable as BF documents. However, the use of individual BF cards for each case would not have overcome the problem of volume, so a multi-trader BF card based on weekly BF dates was designed. The VAT registration number is a nine-digit number (e.g. 936 1046 12). The first three digits denote the local office where registration took place, the next four digits are sequential numbers, the last two digits are computer check digits and have no filing significance. The BF cards were designed so that each Clerical Officer could hold, for each BF week, a separate card relating to each of the local office location numbers for which he

had responsibility. The cards were divided into 10 columns, headed 0 to 9, so that the sequential part of the registration number of any trader could be entered in the appropriate column of the relevant card, as illustrated below.

LVO LONDON WEST							B.F. DATE	MONTH 6	WEEK 3
ORDINARY B.F CASES							REG. No. (FIRST 3 DIGITS)		936
0	1	2	3	4	5	6	7	8	9
0272	1046	2837		4612	5840	6700		8120	9080
0875	1282	2463		4412	5732	6782			9121
0164	1989	2981			5621	6600			9004
	1650				5984				
					5463				

Each card could have numerous registration numbers entered at random, but the design ensured a rough sort to aid retrieval of cases at the BF date. The BF record of a typical Process Unit could thus be contained on about 150 cards. This replaced the 40 spring-clip boxes of BF documents previously held by the same unit.

Improved filing system

Various alternative filing systems were considered in the context of comparative costs, accommodation needs and procedural requirements. O & M concluded that the files should stand on shelves in standard cupboards, and be provided with special indexed dividers of a type which could be easily moved to allow for the maximum flexibility for growth and contraction. The 'Fastashelf' system was chosen and special folders and progress forms were designed to gain maximum advantage from the system. The existing clear plastics jackets had the advantage of re-use, since the progress document was held as a top copy and showed the registration number and other indicators relevant to filing. Unfortunately the jackets were not suitable for standing on shelves, so a manila folder was designed in a size marginally bigger than A4. The left-hand and bottom edges of the folder were closed, whereas the right-hand and top edges were open. In addition, the right-hand corner of the front of the folder was cut away so that, by using a specially designed progress sheet, the registration number and filing codes could be seen when inserted. The design allowed for easy identification of cases, and enabled staff to file papers on which no action was required without removing folders from the shelf. It was intended that four filing shelves and a pull-out working shelf should be fitted to each cupboard.

Pilot exercises

Although O & M were satisfied that the proposed systems would be efficient, it was important to demonstrate them in a working environment. With the full co-operation of the management and staff concerned a pilot study was mounted on one complete Process Unit. A unit with more problems than most was chosen in order to give the system a thorough test, and a complete conversion was undertaken by the staff concerned under the joint direction of O & M and their own management. The benefits to be gained soon became evident, and solutions to minor difficulties arising during implementation and subsequent working were quickly found. The pilot study enabled O & M to assess the overall benefits which could be achieved by implementation throughout the division. It was possible to prove that, by adopting the system as installed in the pilot unit, at least 20 per cent of the existing filing accommodation could be saved and a saving of 25 per cent of the staff engaged on filing could be expected.

Savings and other benefits

The recommendations for the improved systems were accepted and have been implemented. The costs of implementation were estimated at £28,000, but the value of filing equipment surplus to requirements exceeded this amount. Far more important were the on-going net annual savings estimated at £75,000, which were attributable in the main to the saving of 29 Clerical Assistants. These savings have been achieved as a result of implementation.

In addition the changes have been beneficial to the staff. The heavy lifting which gave rise to many complaints has been eliminated and the frustrations arising from the seemingly endless search for documents have been considerably eased.

Filing in local VAT offices (LVOs)

At the time of the review of local office filing there were 70 LVOs. During the review 14 were visited and the views of key users of the filing system sought. All other offices were given the opportunity to submit written suggestions and comments for consideration by the review team and, in fact, most contributed. In addition, numerous other suggestions related to the subject of the review were received from staff via the Suggestions Committee.

There is a manual filing system at each LVO, consisting of a folder for each registered trader. In setting up the original system certain assumptions were made. On the assumption that the folder would contain no more than a few documents relating to the registration details of the trader, plus reports of control visits made to his premises, its design was kept simple. It consisted of a thin wallet with a flap to cover the contents. It was also assumed that, since most of the records were held centrally and tax collection was to be conducted generally between Headquarters and the individual trader, the local folder would

be retrieved only rarely (e.g. at the time of a routine control visit). The folders were, therefore, filed in numerical order by reference to the trader's VAT registration number, and housed in pockets suspended from rails fitted into standard issue shutter-fronted cupboards, each pocket containing a maximum of 20 folders. A further assumption was that once the VAT register was set up it would be more or less static, with relatively little variation in the trader population. In practice these assumptions proved to be incorrect.

Problems

The number of traders who have deregistered and the number of transfers between LVOs due to traders moving to new addresses, has been far higher than expected. In addition, there has been a steady growth in the total number of registered traders, resulting in an expansion of the filing systems at most LVOs. Although the folders of deregistered traders were held separately, it was not a practical proposition, under the original filing system, to utilize the space created by the removal of cancelled or transferred folders. This was due in part to the type of suspended pockets in use which proved to be inflexible for the purpose, and partly to the filing of folders in numerical sequence. Utilization of space entailed a constant shuffling of folders throughout the system to create space at the end for the folders of newly registered traders. Re-use of registration numbers was not considered practicable as each number was intended to be a unique reference to a single trader.

Because of the difficulties which both our own staff and traders experienced in getting to grips with the VAT system, large quantities of paper work were generated at Headquarters, much of it in the form of output from the computer. A high proportion of this paper was passed to LVOs, where some of it had to be filed in the relevant traders' folders. It soon became apparent that in some cases the folder was too small. Furthermore there was no provision for the segregation of papers according to their usefulness. The suspended pockets were inflexible in that they were of a standard size and some of the folders filed in them had become very bulky. As a result the folders and the pockets started to deteriorate, particularly at larger LVOs. The filing systems had grown rapidly and the number of cupboards required, and consequently the amount of valuable office accommodation occupied for filing, had increased steadily.

Cancelled folders were also becoming a problem, because they too occupied much valuable space (they represented a quarter of the total number of folders in some offices). They could not be destroyed altogether in the short term, however, since there was a legal requirement to retain some of the information they contained for several years.

Improved filing equipment and techniques

The solutions to these problems were the result of some months of deliberation, experimentation with ideas and discussions with staff

in both Headquarters and the outfield. The main solutions were the adoption of a Terminal Digit Filing (TDF) system in conjunction with a new flexible shelf storage system of the same type recommended for use in Enforcement Division. In order to test these solutions, pilot filing systems using TDF were set up at two LVOs. At one office the existing suspended pockets were used and at the other the new filing equipment was installed. The cost of the new system was minimized by making use of the existing rails. Rigid metal shelves, which rest on the lower rails, were provided and these, together with the dividers, gave the necessary support to the folders. The dividers, which are made of durable board, were clipped on to the shelf underneath and hooked on to the rail above. They could then be moved laterally to allow for fluctuations in the size or number of folders to be accommodated between each divider. Each divider was provided with a title holder.

The TDF system used was based on the fifth, sixth and seventh digits of the registration number (e.g. 936 *1046* 12), the check digits being ignored. The system was first divided into 100 primary filing locations (00–99) using the sixth and seventh digits and all folders with registration numbers ending with these digits were stored together. Each primary location was then divided into 10 secondary locations (0–9), using the fifth digit, each of which was identified by a labelled shelf divider or pocket according to the filing equipment used. Within each secondary location folders were stored in numerical order of the registration numbers, by reference to the first four digits. For example, the folders stored in primary location 46, secondary location 0, might run as follows:

901 6046*	936 4046
936 0046	936 7046
936 1046	936 8046
936 3046	982 3046*

* Transfer in from another office.

An added advantage in the use of TDF is that folders transferred from other offices can be incorporated into the main filing system, avoiding the need for separate filing accommodation. Since registration numbers are generated in numerical order within each sequence (ignoring the check digits), there is an even spread of numbers amongst new registrations. Similarly, over a period of time the number of de-registrations is also evenly spread and tends to balance out some of the growth in registrations. The net growth in the number of traders' folders in each part of the system is, therefore, fairly even. TDF reduces the problem of end growth, since growth is absorbed within the system to a large extent.

The pilot systems were successful in both LVOs where they have continued working for two years. It is evident, however, that in the long term, dividers will be preferable to suspended pockets, since they allow greater flexibility. Several other offices have since changed over

to TDF and it is anticipated that the changeover in all offices will be complete by the end of 1978. Most staff who have used the system are enthusiastic about it and would not wish to return to the previous system.

The folder has been redesigned to include a gusset to allow for expansion. It consists of a wallet similar to that contained in the existing folder with the addition of two new compartments. Each of the internal surfaces created in the folder has been overprinted with a suitable title, and documents will be attached to these surfaces with india tags so that segregation, according to purpose and permanence, can be achieved. The proposals for new folders have been accepted and implementation is progressing independently of the changes to the filing equipment and the introduction of TDF.

Apart from these main changes, several other improvements have been suggested. Briefly these cover areas such as specially designed 'sleeper' cards, an annual census of folders, a bring-forward system for folders, standardization of folder requisition and direct movement slips, the introduction of a progress chasing system and the creation of a destruction policy for the folders of deregistered traders. Where necessary, computer print-outs and forms will be provided in TDF order to facilitate filing. Management are also considering their policy on the weeding of folders.

Savings

It has been calculated that, once fully implemented, the changes will bring about savings, mainly in the cost of space and equipment, of some £300,000 over 10 years, after allowing for the capital cost of providing any new equipment.

Conclusions

The two assignments have demonstrated the advantages to be gained from the use of flexible dividers for shelf filing systems. The use of terminal digit filing, adapted to the particular requirements of LVOs, confirms its value in the economical use of filing space. The adoption of a simple card index system for Enforcement Division enables staff to control a large BF system with a very small card index.

O & M staff on both assignments had the benefit of the willing co-operation of the management and staff concerned in the mounting of pilot studies. These were on an adequate scale to test the systems properly under true working conditions, and it was of considerable advantage, in the task of convincing management of the value of the systems, to be able to demonstrate their efficiency in practice and to have the enthusiastic support of the staff involved.

Making the Best Use of Your Human Resources

W. A. R. WOLFE, Civil Service Department

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The most valuable asset of any organization is its man—and woman—power resources. The Civil Service is no exception in this respect and it is essential that the best use is made of these resources which, being human in every sense of the word, need something more than the kind of care and maintenance that is given to more material resources such as plant and machinery.

But at this point, two questions must be posed: as a value can be placed on other resources, so can a value be placed on human resources in terms of money invested in recruitment, pay, termination costs and other benefits; so, if one can account for human resources in much the same way as for material resources, then should it not be possible to ensure its maximum effectiveness by applying similar criteria to its use as to plant and machinery? The second question asks whether, in view of the number of outside organizations set up to help people with every conceivable kind of problem, should this not be sufficient, particularly in relation to problems arising outside the working environment?

Having invested resources in valuable plant, it is accepted that it will be asked only to perform the task for which it was designed, and to play one part in the appropriate sequence of operations. It will need regular care and maintenance if it is to continue to function efficiently: should it break down, further resources will be utilized in its repair and return to service. Operators and line management will be responsible for basic day-to-day care and maintenance, but more complex matters will be handled by skilled people with the training, knowledge and resources—including time—for the task. So also with that most valuable yet most vulnerable and unpredictable resource, the employee. But here the analogy must end.

Unlike human beings, a machine does not form a relationship with another part of the plant, or react to the behaviour of another piece of equipment unless it is designed or programmed so to do. There is a predictable relationship between one machine and another, and with its environment and use. When the working day is over there will be no external influences to affect its subsequent performance. But human resources are human: people are not cast all in the same mould, their reactions and relationships can be unpredictable, and they can be

affected by social and domestic situations outside the work-place. The stresses and strains on the individual, however caused, can have a detrimental effect on performance at work and this should be as important a concern of management at all levels as the more material incentives to efficiency. Line managers can and should take an immediate interest in the personal welfare of their staff. An understanding manager can deal with many personal problems or ease the way to their solution. It may be possible to allow a longer lunch break, to be made up later, in which a person may settle a private matter, or a slight easing of the workload at a time of stress may be all that is required. Even a few moments lending a sympathetic ear to a member of staff can be invaluable.

But to return to the analogy, just as the operator or manager may ensure that the machinery is cleaned and oiled, and may be able to make minor adjustments, there comes a time when he has neither the time nor the skill or knowledge to deal with more complicated problems. So also must the manager recognize the need for skilled help with human problems, whether these arise directly from the work situation or as a result of external pressures. There is an understandable tendency in all 'men of the world' to accept the need for technical advice in material or mechanical matters, but to assume that they have enough experience and knowledge of human nature to deal with other people's personal problems. This can lead to the giving of advice—often prefaced with the fateful words 'If I were you'—which does little or nothing to help the recipient in the longer term. It is at this point that the Welfare Officer, with a working knowledge and experience of the department, and with training, skill and experience in dealing with personal problems, can supply the expert help and give the time in which to apply it. One of these skills is the counselling of others so as to help them to resolve their problems using their own latent resources, supplying from their knowledge and experience any information or external resources necessary for the person to make a decision, which in some instances may be to seek further help from other more specialized agencies.

Similarly, there can be a tendency on the part of managers to assume an ability to understand, in 'human' terms, any situation arising in the work context, such as personal or group interaction, the social and domestic background to problems of absence or discipline (and often to ignore them as irrelevant). Again, it is in such situations that the skill, knowledge and experience of the Welfare Officer can be used by management as an aid to overcoming this kind of problem.

The many agencies that exist to help individuals with their personal problems can be of great help, and many people will be able to make a direct approach to the appropriate organization. But the multiplicity of organizations, the difficulty of finding just the right organization to deal with a particular problem, and, more particularly, the fact that the person may not be fully aware of the nature of the problem that is

causing difficulty at home or at work, all support the need for the help of a knowledgeable and experienced Welfare Officer who will be able to talk over a person's problems and help him to determine their true nature, and possibly arrive at a solution, or where further help is needed to direct him to the best source of assistance.

To be effective, therefore, care and concern for staff as people who may have personal problems or be affected by working relationships and situations—both of which can have a serious effect on their performance—must operate at two levels: first, through the concern that should be shown by any line manager for the well-being of his staff; and second, through the service of Welfare Officers who can bring specialized training, knowledge and experience to help resolve the problem. The specialized knowledge of the Welfare Officer can also be of inestimable value to the manager himself in the solution of problems such as may arise from relationships within the workplace, or from the behaviour or attitudes of individual members of his staff. The Welfare Officer must, therefore, be regarded as equally accessible to managers and staff, and one of the prime requirements for full accessibility and acceptability by staff is that of confidentiality of the personal interview. This, and the essential quality or 'professionalism' of the Welfare Officer, is the key to successful staff welfare work.

This, in essence, is the aim of staff welfare in the Civil Service. Organized departmentally, 430 Staff Welfare Officers are available to staff and managers to help in the resolution of difficulties that arise from the simple fact that civil servants—our 'human resources'—are people. It is difficult to argue the value of a service of this kind in terms of cost-effectiveness, but there is little doubt that the relatively small cost of providing this service is repaid amply in the improved effectiveness of staff to whom help is given, and in the advantages to management of advice on group problems, sickness and the background to disciplinary and other kinds of problem case. And if, by the use of skilled counselling and help, the Welfare Officer can relieve personal strain and prevent deterioration and possible discharge of an otherwise useful member of staff, save the considerable expense of his failure and replacement, or relieve the strains and stresses that might lead to costly errors in his work, then the cost of welfare services is indeed money well spent.

So, if the best use is to be made of this service, everyone, managers and staff, must be fully aware of its availability and make use of it. The skilled mechanic is brought in to provide the knowledge, expertise and time to deal with a mechanical adjustment or malfunction so as to get the best possible performance from plant and machinery: an understanding and caring attitude, and the skilled help of experienced welfare staff, can help to remove the stresses and strains of unresolved personal problems or group situations that arise because staff are human, and this is one way of ensuring that the best use is made of your 'human resources'.

Management Accounting in the Civil Service

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Introduction

There are already many and varied management accounting systems in various stages of development within the Civil Service. In some areas costs have been collected for many years dating back as far as the days of Samuel Pepys in the Navy Department, but in other areas the collection of costs and their use for management purposes is a fairly recent innovation.

The application of management accounting in the Civil Service is discussed in general terms in Chapter 5 of the handbook *Management Accounting in the Civil Service*,* and some specific applications in selected areas are described in Appendix G of the same handbook. As one would expect, the most well-developed, long-standing, sophisticated and detailed systems are in industrial establishments. The more recent systems, some of which are still in the process of being implemented, are in the field of supplies and services. But in large areas of the Civil Service the use of management accounting is non-existent.

Applicability of management accounting to the Civil Service

It is often argued that management accounting is inapplicable to the Civil Service in general because it is non-profit making, subject to policy considerations irrespective of cost and largely non-industrial. Yet like any private concern the Civil Service has to be effective and efficient. Government needs to know the cost of particular policy decisions and there is no reason why the application of management accounting should be limited to industrial and trading activities. The Civil Service has been likened to the overheads of Great Britain Limited and as such its expenditure and use of resources need to be scrutinized closely and effectively controlled.

Clearly there are problems in the operation of management accounting within the Civil Service stemming from:

(*a*) The range and diversity of government activities, even within a single department (e.g. Ministry of Defence).
(*b*) The absence of suitable basic data (e.g. asset records).
(*c*) The inadequacy of existing accounts.
(*d*) The lack of a ready-made yardstick such as 'profitability'.
(*e*) The identification of suitable units of measurement (e.g. health, education).

**Management Accounting in the Civil Service.* A Management Services handbook published by the Civil Service Department in the General Service Forms series (E.136).

(*f*) The non-availability of comparable costs (e.g. tax collection, training a soldier).

Such problems, while making the application of management accounting difficult, do not render invalid the need for some measure of effectiveness and efficiency. In the absence of reasonably reliable and up-to-date information decisions can only be at best subjectively based and at worst arbitrary: policy decisions may be unsoundly based and may not be implemented in the most cost-effective way; without proper appraisal capital projects may be undertaken uneconomically; the need for the continuation of particular practices and procedures are reviewed more critically if their full cost is known.

Sophisticated expensive systems of control will normally only be necessary where the task is large and complicated and where the potential savings justify them. In many areas the use of the *Ready Reckoner for Staff Costs** will provide a sufficiently reliable guide to costs. Frequently simple physical measures of output will be all that is needed. Information can be collected and presented on a continuous basis or as and when required. Often the information is already available and requires only collation and presentation to the appropriate level of management.

Possible applications

The applications below are suggestions only and are not exhaustive in their scope. Some of them are small in terms of total spend, but, even so, they contribute to total cost and therefore need to be controlled.

Computer systems

Costs can be collected quarterly and analysed by function: systems design, programming, data preparation, computer operation, etc. Costs so collected can be more equitably allocated to outputs using manufacturers' operating systems, or apportioned on a time basis for computer operations, or on a time or usage basis for other functions.

Training

Measures of utilization of capacity can be developed differentiating between theoretical and practical capacity for individual courses, places provided and places taken up. A knowledge of spare capacity and direct costs will assist in deciding whether to provide a course in-house or externally. Effectiveness can be partly measured by comparing numbers trained with target population and monitoring trends.

Committee meetings

Committee meetings consume considerable manpower resources. An analysis of each meeting showing the number of major decisions taken, the extent to which the business could have been more cost-effectively conducted by other means (telephone or correspondence), the number

**Ready Reckoner for Staff Costs.* A Management Services handbook published by the Civil Service Department. For official use only.

of participants and the extent of their participation and total cost (using *Ready Reckoner* rates) could lead to a more cost-conscious approach to the use of meetings and the numbers called to them.

Travelling and subsistence
Maintenance of a cumulative record by section, subject or individual officer, where appropriate, may highlight areas where economies could be effected without affecting overall effectiveness and efficiency.

Motor transport
Total costs, costs per vehicle and costs per mile will provide an overall measure of the size of the activity compared with total spend, and will show the most cost-effective type of vehicle and whether the amount of use justifies the retention of a vehicle. A record of days in use compared with days available provides a measure of utilization. Annual vehicle costs can be compared with equivalent public transport costs and payment of mileage allowances in determining the most cost-effective provision for transport.

Storage and stocks
Departments maintain large document stores and stocks of items ranging from stationery to gas-turbine engines. The stores themselves will vary in size and complexity from large storage establishments holding a wide range of items down to small divisional stationery stores. Similarly the need for and nature of the information needed to maintain control of such diverse arrangements will vary from the sophisticated to the simple. Measures of usage against level of stock will help to avoid expensive overstocking or unexpected deficiencies; and, in larger organizations, knowledge of the total and various elements of the cost of providing the storage facility will aid in decisions on the retention of documents, resiting of storage accommodation either in less expensive buildings or cheaper geographical areas, and on the need for capital expenditure to reduce manpower costs.

Reprographic units
The total cost of departmental reprographic units analysed by type of process will provide a basis for measuring the cost of output. If this is compared with an estimate (or budget) variances can be investigated and appropriate action taken. The estimates and actual figures of output compared with total capacity will indicate the degree of utilization of machines and manpower.

Policy and casework and general clerical work
Policy and casework and general clerical work are frequently said to be impossible to control or measure effectively because of the variety of the problems, documents, or cases dealt with and because of the varying incidence of interruptions such as telephone calls and casual visitors. Even so, some attempt needs to be made to measure the cost of such activities and to maintain effective control of the amount of

work on hand. Assuming that interruptions are a necessary overhead of the job these can be ignored and records maintained to the nearest half-day of time spent on major elements of policy, types of cases or important individual cases. It may be cheaper to concede particular cases, relax the rules or delegate authority rather than continue with their detailed scrutiny or consideration. Periodical returns of documents, cases/files brought forward, received, dealt with and outstanding, with an analysis of the latter, will ensure that the build-up of a backlog is brought to notice at an early date. Periodical lists of cases or problems of more than a given age will provide control of individual cases.

Conclusion

There are many areas where a simple periodical return will provide a measure of control. Often the information falls easily from records already held or requires an insignificant amount of effort to obtain it. It is important that the information or a summary of it should reach a level of management at which corrective action can be initiated and that those who receive the information should be seen to be making effective use of it. Management information should be the basis of a two-way communication providing all levels of staff in the organization with the means and motivation to improve efficiency and effectiveness.

Management Consultants in Government

We have from time to time published lists of management consultancy assignments commissioned by government departments. The last such list, covering the calendar year 1976, appeared in the February 1977 edition of MANAGEMENT SERVICES IN GOVERNMENT.

A list of such assignments commissioned during the calendar year 1977 now follows. The list excludes:

(*a*) Computer consultancy (including assistance with computer systems and programming).
(*b*) The employment of consulting staff, whether on secondment from their firms or not, to augment departmental teams.

Advice to departments on the use of management consultants is given in *Code of Practice for the Use of Management Consultants by Government Departments*, copies of which may be obtained from Her Majesty's Stationery Office (price 31p to persons and organizations outside the Civil Service).

Department	*Nature of assignment*	*Consultant used*
Defence, Ministry of	Further work on measurement techniques at Donnington—survey of Command and Central Workshops	Inbucon/AIC Ltd.
Employment, Department of ..	Design of jobs and organization of work project at Tannoy Ltd.	Weir Partners (Management Services) Ltd.
Environment, Department of the ..	To prepare management games in preparation for urban redevelopment consultations	The Boisot Waters Cohen Partnership
	Study of local authorities' information needs	Institute of Local Government Studies and Birmingham University Social Services Unit
	Study of local authorities' data holdings	Local Government Operational Research Unit
Health and Social Security, Department of	Further work on ambulance service control	Cranfield Institute of Technology
	Further work on OR study of social security benefits—review and checking	Orcon Services Ltd. and Wootton, Jeffreys & Partners
	OR study of treatment of oat-cell carcinoma of the bronchus	Scicon Ltd.
	To conduct a survey on private medical care—Provident Schemes statistics	Lee Donaldson Associates
	Further work on OR study of treatment of Hodgkin's disease	Logica Ltd.
	OR study of treatment of acute myeloid leukaemia	Logica Ltd.
	OR feasibility study of cancer patient flows	Mandecs Ltd.
Home Office	Market research project and advice on production of clocks/timing mechanisms for prison industries	Bowhurst Ltd.
	To advise on long-term marketing strategy for plastics/electrical industry in prisons	Furniture Industry Research Association
Industry, Department of	Study of process engineering industry	Sira Institute Ltd.
	Study of market for data buoys	General Technology Systems Ltd.
	Study of marine engineering equipment industry	P-E Corporate Strategy Ltd.

Department	*Nature of assignment*	*Consultant used*
Industry, Department of—*continued*	Study of United Kingdom textile dyeing and printing machinery industry	Metra Consulting Group Ltd.
	Study of feasibility of computer-controlled cutting bureaux in clothing industry	Metra Consulting Group Ltd.
	Study of job responsibilities in materials handling in selected industries	William Hesketh (Associates) Ltd; Polytechnic of Central London; and Industrial Training Service
	Study of selected sectors of electronic components industry	Sira Institute Ltd.
	Study of selected sectors of electronic components industry	Electrical Research Association
	Study of selected sectors of electronic components industry	Mackintosh Consultants Co. Ltd.
	Study of possible R and D investment in ships' inert gas systems	Double L Consultants Ltd.
	Study of small business management training needs	Manchester Business School (Centre for Business Research)
	Study of development of computer-aided draughting	Ingersoll Manufacturing Consultants and Coopers & Lybrand Associates Ltd.
	Study of possible commercial and industrial revitalization of Port of Liverpool (Inner Merseyside) area	PA Management Consultants Ltd.
Manpower Services Commission ..	OR study of industrial training in the Midlands	Institute for Operational Research
	Preliminary study of major administrative procedures for introducing new special programmes for the unemployed	PA Management Consultants Ltd.
	Training for vital skills project—effects of technological change on employment	PA Management Consultants Ltd.
Employment Service Agency ..	Study of staff costing methods	PA Management Consultants Ltd.
Training Services Agency ..	Training data for a proposed new Scottish local authority training organization	Industrial Training Service

Department	*Nature of assignment*	*Consultant used*
Training Services Agency—*continued*	Study to evaluate and provide data for the terminal training period of the clerical award scheme	Research Bureau Ltd.
	To develop a marketing scheme for sponsored training	RH & A (Recruiting and Training) Ltd.
Royal Ordnance Factories	Audit of the Universal Maintenance Systems (UMS) scheme at ROF Glascoed	H. B. Maynard & Co. Ltd
	Study of catering requirements at ROF Bishopton	Horwath & Horwath (UK) Ltd.
	Re-assessing production technology at RSAF Enfield	PA Management Consultants Ltd.
Transport, Department of	Research project on crew costs of bus operations	Arthur Andersen & Co.
	Study of industrial location and freight transport in Hull	Economist Intelligence Unit Ltd.
	Further work on study of the finances of the Port of London Authority	Price Waterhouse Associates
Treasury, Her Majesty's	Joint study of compensation principles and structure for International Monetary Fund and International Bank for Reconstruction and Development sponsored by the Governments of France, Federal Republic of Germany, Japan, United Kingdom and USA	Towers, Perrin, Forster & Crosby Inc. and Coopers & Lybrand Associates Ltd.
Welsh Office	OR study of stores location	National Coal Board OR Executive
	A group of OR studies for the National Health Service in Wales	Royal Institute of Public Administration OR Unit

Networks for the Blind

F. OFFLER, Civil Service Department

Fred Offler is Course Director in Project Network Technique at the Civil Service College (Systems Training). In the article that follows he draws attention to a new development in the field of network analysis which was designed especially for the blind. The purpose of the article is to publicise this development as widely as possible so that the blind may be given the opportunity to develop expertise in the techniques involved: the author has no pecuniary interest having donated all rights to published material to the blind.

Editors of publications wishing to reproduce the article may do so without seeking formal permission. An acknowledgement to source would be appreciated.—*Editor.*

Managers may not be aware that a seed of exciting potential has been sown in the field of Project Network Technique (*née* Critical Path Analysis, PERT, etc.).

Twelve blind members of the British Computer Association of the Blind, representing cross-sections of both commerce and the Civil Service, were taught Project Network Technique by the Offler Method of Network Analysis for the Blind, on a two-part course entitled 'Networks for the Blind', held at the Universities of Leeds and Reading.

The method by which they were taught has broken the barrier which has existed for 25 years during which time the blind have been excluded from full participation because networks have always been considered to be a pictorial, or graphical, representation of a project.

The method allows for full application of all aspects of the technique, viz: logic; event numbering; time analysis; event slack and activity float; conversion to calendar; up-dating and control; scheduling; resource aggregation, smoothing and levelling; computerization; and variable durations and costs. The primary aim is to impart a full understanding of the technique but a significant secondary spin-off is its infallibility. Whatever the order in which the activities are recorded on the original list of jobs to be done, the method *guarantees, inter alia*:

(*a*) A unique identity to each activity.
(*b*) A logically correct 'diagram' with all, and only, the required logic dummies.
(*c*) A network numbered progressively from start to finish with every head event number greater than the number of its corresponding tail event.
(*d*) A properly time-analysed network with critical activities identified.
(*e*) The usual tabulation of float and earliest and latest start and finish dates.
(*f*) A simple method of effectively allocating resources.

The course is published, as a full teaching package, in three forms:

(*a*) In ink-print form, enabling the sighted to teach the blind. (Only a limited number of copies of this book have been printed. They are not for sale but are available to bona fide teachers direct from the author.)
(*b*) In braille, enabling the blind to teach the blind.
(*c*) As a cassette/braille package enabling the blind to teach themselves.

Requests for details of these publications should be made as follows:

(*a*) Mr. F. Offler, Civil Service College, 11 Belgrave Road, London SW1V 1RB.

(*b*) The Students' Library
(*c*) The Talking Book Service

} Royal National Institute for the Blind, 224 Great Portland Street, London W1N 6AA.

The Offler Method is registered in the International Register of Research on Blindness and Visual Impairment and is being evaluated in a number of countries overseas.

Having completed the task I set out to do, all that remains is to make management aware of this capability, at the same time stressing that it is new, for which some allowance must be made until the blind become proficient in its use. In a way it is up to the blind to develop an expertise matching, or even superior, to that of their sighted colleagues. I have but two requests: one is that management will nurture this seedling through to maturity; the second is that editors of management publications will reproduce this article in full.

Some recently published titles

Training in the Civil Service. Edited by R. A. W. Rhodes. Published by the Joint University Council for Social and Public Administration, price £1·50.

Britain 1978—An Official Handbook. Published by Her Majesty's Stationery Office, price £6·00

Direct participation in action: the new bureaucracy, by D. Pace and J. Hunter. Published by Saxon House, Teakfield Limited, price £6·50.

Editor.

Professional Accountancy Training in the Civil Service

D. JAMIESON, Civil Service Department

In recent years the Civil Service has, in its own modest way, begun to train selected members of its own staff for professional accountancy qualifications. Previously, much had been said about the need for more professional accountants in the Civil Service and the difficulties of recruiting them from outside. Little had been said about the in-house training of their own staff up to professional level. While any large organization benefits from an inflow of new blood, it is also true that the Civil Service training scheme achieves the best of both worlds—professionally trained accountants who are also well versed in Civil Service ways and who possess a detailed knowledge of their own particular departments. How long ago did this process start, how many trained accountants has it produced and what are the prospects for the future?

Before answering any of these questions it is vitally important to stress one fundamental principle regarding accounting in the Civil Service. This is that the Civil Service regards all the main accountancy bodies as being of equal status. The Service does not differentiate between Chartered, Certified, Public Finance or Cost and Management Accountants. Indeed, in the Civil Service Department itself, the Management Services (Accountancy) Division, which undertakes a variety of accounting assignments in various government departments (usually involving the installation of an improved system), comprises qualified members of all the main bodies and yet they all do the same sort of work. A true case of integration of the profession if ever there was one!

It is, of course, also true that some departments, because their accountancy needs are primarily of one specific aspect of the discipline, tend to prefer members from the particular accounting body which specializes in that aspect. Thus, the Department of Industry, for example, where knowledge of commercial accounts is particularly relevant, tends to employ more chartered and certified accountants. Both the Exchequer and Audit Department and the District Audit Service of the Department of the Environment seek members of CIPFA and have training schemes for the CIPFA examinations. The Ministry of Defence with its large number of industrial establishments, such as ordnance factories and dockyards, opts mainly for cost and management accountants.

To a certain extent it has, for many years, been possible to obtain a professional qualification through the Civil Service since it was possible

for potential candidates to have their tuition and examination fees refunded if the relevant department was prepared to sponsor the prospective accountant. Official training schemes have now advanced beyond this stage and outside the rather specialized area of the District Audit Service there are now three main schemes (two centrally sponsored and one departmental), whereby civil servants receive sponsored training. In chronological order of development these are the ICMA Training Scheme, the Chartered Accountant Bursary Scheme and the CIPFA Scheme.

ICMA training scheme

This scheme was initiated in about 1960 by the Royal Army Pay Corps at their training centre at Worthy Down near Winchester. Originally initiated solely for RAPC officers and other ranks this course was thrown open, in the mid-1960s, to civil servants employed by the Army Department. A year or two later the course was made available to all civil servants employed in the Ministry of Defence and in 1975 this was again extended to members of other government departments. The course itself is very intensive and involves 12 months' postal tuition for the two Foundation level examinations followed by 12 months' full-time residential study for the two Professional level examinations, the third Professional examination being partly covered during this period and partly covered by private work after the end of the 12-month full-time course.

A substantial number of the 300 qualified accountants in the Ministry of Defence obtained their qualification in this way and currently there are some 30 members of other departments at various stages of the course. These students are from a variety of different departments including Employment, Environment, Health and Social Security, Civil Service Department, Export Credits Guarantee Department, Her Majesty's Stationery Office, Royal Mint, Transport, Exchequer and Audit Department and the Treasury. The success rate on this course is very high. Worthy Down are used to achieving at least an 80 per cent pass rate and in the May 1977 examinations the civilian students from these departments achieved a 100 per cent success rate and included one prize winner. Commenting on the success, Mr. Kenneth Sharp, Head of the Government Accounting Service, said: 'This is a most encouraging start which augurs well for the future. It is important that financial skills in government departments should continue to be improved and there are varied opportunities of great challenge for accountants.'

Chartered Accountant bursary scheme

In 1975 the Civil Service Department introduced a full-time bursary scheme to assist civil servants to train for membership of the Institute of Chartered Accountants. Officers selected under this scheme have to serve for either three years (graduates) or four years (non-graduates) under a training contract in a professional accountant's office. Non-

graduates are also obliged, unless exempt, to undertake a full-time foundation course for one academic year (nine months) at an appropriate college. Currently there are some nine students studying various stages of their examination under this scheme.

CIPFA scheme

Since 1975 the Exchequer and Audit Department have required all new entrants to the Assistant Auditor grade to train for an accounting qualification, and they are running a scheme leading to the CIPFA qualification, which is considered the most useful for the Department's needs. An Assistant Auditor who fails to qualify must leave the Department. If, however, CSD is otherwise satisfied with his performance, and subject to the availability of vacancies, it may be possible to transfer him to the Administration Group of the general Civil Service.

The course is run for the Department by the City of London Polytechnic and covers a four-year period. This involves a nine-month full-time foundation course or, for graduates, a 13-week graduate conversion course, followed by a 13-week block release period during the first six months of each of three years after which the professional examinations are taken. At present there are some 80–90 officers at various stages of this training.

Some other departments are now beginning to express an interest in having some of their staff (mainly in the internal audit field) trained for the CIPFA qualification. The Exchequer and Audit Department would consider the possibility of taking students from other departments into their scheme where the numbers involved do not merit separate departmental arrangements.

Conclusion

Readers may comment that none of these numbers are very impressive when measured against the 500,000 non-industrial civil servants, or the £36,000 million per annum which is spent by the Civil Service, or even the fact that the number of professional accountants in the Civil Service is still less than 1,000. However, no one can deny that these three schemes do represent the start of a trickle which could develop, if not into a flood, at least into a respectable stream. Certainly as the benefits of professional accounting techniques and the personal qualities and abilities of professional accountants come to be accepted more throughout the Civil Service, there can surely be little doubt that the demands placed on these schemes will grow greater and greater. Members of the various professional accountancy bodies mentioned in this article will be very pleased to see their own Institutes, deservedly, playing a major part in these small beginnings. All accountants should applaud these developments and see in the success of each of them success for the profession as a whole. The increasing co-operation between the different accounting bodies (the joint technician examinations of CIPFA and ICMA, for example) can, in the author's view, do nothing but good in fostering these developments within the Service.

Audio Cassettes for the Manager's Bookshelf

Mrs. B. M. HOWARD, Civil Service Department

'Read all about it' used to be the cry. Nowadays the student—and the businessman—can use his ears as well as his eyes to keep himself informed: the pre-recorded spoken-word audio cassette is beginning to revolutionize the bookshelf. Tapes no longer just contain music: they can help to improve your bridge or teach you yoga—or be commentaries on tax planning, the Community Land Act, or inflation accounting. Cassettes are being issued by law publishers, by institutes and societies, and by firms specializing in the production of training packages. Unfortunately this material is very hard to trace, as will be explained later; it may, therefore, be useful to mention some British publishers of compact cassettes likely to be of interest to the manager and to the businessman.

Why audio?

What are the advantages of audio cassettes over the conventional book? Tapes have immediacy since they can be produced within weeks of the introduction of new legislation, as opposed to the months needed for the printing of comprehensive legal texts. Similarly they can be regularly and cheaply up-dated. Some take the form of lectures while others are staged interviews, offering a variety of viewpoints. The tape can be stopped at will and re-run an infinite number of times, making the cassette useful for individualized staff training, particularly for those who find it easier to retain orally, rather than visually, transmitted information. They are invaluable to the blind. Tapes can be run on many types of cassette player, including battery-operated machines, in-car installations or decks attached to hi-fi systems; the busy executive can, therefore, find opportunities to absorb information without encroaching on his day-to-day desk work. Also the cassette will weigh down his briefcase less than will the printed text!

The purchaser may wish to listen to the tape before investing since he has become accustomed to this option before buying a book. But because cassettes can be damaged by clumsy handling this may not always be possible, although increasingly there are means of so doing. Libraries are beginning to buy tapes to lend to their customers and at least one publisher offers listening facilities. A few audio producers offer an alternative sale or loan facility.

The average cost of a non-music audio cassette is about £6·00. Some more expensive packages include training material, slides, booklets, etc.

As with printed texts, there is duplication of subject coverage between various publishers, as well as differences in treatment and in price. For example, tapes on Capital Transfer Tax are available from: the Association of Certified Accountants (£6·80 for two cassettes); Butterworth (£12·50, plus VAT, for two); Financial Times–Waterlow (£13·50 for two); and the Institute of Chartered Accountants in England and Wales (£19·44 for three, each with a user's guide).

Some publishers package the cassette and its accompanying booklet in a box which can conveniently stand on the bookshelf. Others issue tape and text unpackaged, creating difficulties of housing. A useful ancillary available from one publisher is a binder designed to hold eight cassettes in a 'book' format.

As well as single-topic cassettes, a few are appearing as serials. Among these is the *Quarterly Tax Bulletin*, issued by the Institute of Chartered Accountants in England and Wales. This contains brief summaries of the latest developments in direct and indirect taxation; it embraces both Parliamentary business—including relevant Debates, Bills, Acts and Statutory Instruments—and other matters such as Decided Cases, Inland Revenue Statements, etc. (Annual subscription: £17·28 for four issues.) Butterworth & Co. Ltd (Bell Yard, London WC2) are now producing the *All-England Quarterly Law Cassettes*, which are a précis of the key cases from the All-England Law Reports. The practitioner can thus listen to a summary and then acquire such additional information as he requires from the printed text, to which the tape carries citations. (Annual subscription: £22·00, plus VAT.) A series of recordings on topics of current interest, entitled *International Report*, are issued monthly by Seminar Cassettes Limited (218 Sussex Gardens, London W2 3UD). A standing order may be placed or each issue may be purchased separately. The tapes are compiled from the recorded reports of correspondents world-wide; they contain discussion material, first-hand information and news analysis.

Law and accountancy

Probably the fastest growing areas of audio tapes are law and accountancy. Butterworth's series of 'New Law Cassettes' aims to explain the fundamentals of new legislation, paying particular attention to aspects likely to give rise to practical difficulties. As well as a basic catalogue of audio items, they have a special mailing list to provide customers with up-to-date information about their cassettes. Financial Times–Waterlow (Holywell House, Worship Street, London EC2A 2EN) include both accountancy and legal topics; their editorial consultant is Sir Desmond Heap, past president of the Law Society. Their stocklist is supplemented by a series of leaflets on individual titles. The Solicitors' Law Stationery Society, through its subsidiary Oyez-IBC Limited (Norwich House, Norwich Street, London EC4) are marketing an audio series under the title 'Cassette Law'. This deals with practical and topical issues; most tapes are produced in question and answer format,

but a few are more suitable for lecture presentation. Outline notes are printed on the sleeve of the cassette case.

The Institute of Chartered Accountants are now producing two sets of tapes in addition to the *Bulletin* already mentioned; these are 'Finance Managers' Guidelines' and 'Current Tax Problems'. Titles in both series include a user's guide to supplement the cassette. The Association of Certified Accountants also publishes two series of cassettes: one on taxation, the other on accounting. At the time of writing, the first contained 13 titles, the second five. Information can be obtained from the Secretary (Training), Certified Accountants' Educational Trust, 9 Museum House, Museum Street, London WC1A 1JT. The Institute of Cost and Management Accountants have so far published one educational package (*The Disclosure of Financial Information to Employees*) which comprises a cassette, a user's guide, a booklet and a copy of the ACAS Code of Practice, Number 2. The Chartered Insurance Institute Tuition Service (31 Hillcrest Road, London E18 2JP) have produced a tape dealing with both insurance and non-insurance company accounts. This is accompanied by a specimen set of accounts as well as questions for the student to answer.

Non-specialist publishers

One of the most prolific publishers is the Open University whose 57-page Audio Tape Catalogue is divided into six broad categories: Arts, Social Sciences, Educational Studies, Mathematics, Science, Technology; each of these is further analysed into a dozen or more topics. A special company, Open University Educational Enterprises Limited (12 Cofferidge Close, Stony Stratford, Milton Keynes, MK11 1BY), has been set up to market Open University tapes, films and books. The firm of Audio Learning Limited (84 Queensway, London W2) currently publishes over 250 recordings on History, Geography, English Literature, Politics, Sociology, Biology and Physics. Some have accompanying filmstrips (full frame, 35 mm); all include a supplementary booklet.

Seminar Cassettes, in addition to their *International Report*, issue four other series of tapes which include *Traditional Psychologies*. It is also, perhaps, worth noting two firms whose recordings are directed at the educational market and thus provide basic introductory surveys of the subjects selected. Sussex Tapes (Bradford Road, East Ardsley, Wakefield, West Yorks) are intended for sixth forms and cover such topics as Economics, Politics, Geography, Modern Languages and Education. Economics and Commerce are also among the subjects dealt with by Student Recordings Limited (King Street, Newton Abbot, Devon); they are directed at the GCE and CSE level and the tapes have accompanying colour filmstrips (single frame 35 mm).

Among the tapes from the Manpower Development Unit of the Legal and General Assurance Society Limited (Stephenson House, Brunel Centre, Bletchley, Milton Keynes MK2 2HG) are discussions

of various management skills, such as *Work Planning*; *Delegation*; *Decision-making*; and *Communication*—each with an explanatory booklet. Olymp Training Limited (39/41 South End, Croydon, Surrey, CRo 1BE) produce audio-visual packages on, for example, *Reading Faster*, *Financial Accounting Simplified*, and *Handling Telephone Calls*. A series of eight multi-media packages on aspects of the preparation for retirement (entitled *The Next 20 Years*) is published by the British Life Assurance Trust in collaboration with the Pre-Retirement Association and the Scottish Health Education Unit. Each package includes a cassette, 35 mm slides, a presenter's guide and leaflets for the use of participants. Details are available from: BLAT Centre for Health and Medical Education, BMA House, Tavistock Square, London WC1H 9JP. Finally, Eurotalk Distributors Limited (1A Manor Row, Bradford, BD1 4PF) include in their catalogue a cassette on *Public Speaking*.

Civil Service usage

Several government departments have made their own tapes and audio-visual packages for staff training purposes, and the Civil Service College runs a course in the preparation of tape-slide programmes. The Department of Health and Social Security used audio tapes and associated workbooks as part of a crash programme to acquaint staff with the new or revised statutory and procedural requirements of new legislation. This particular project was used as the basis for an examination of this method of training; further information can be obtained from Mr. C. A. Oldridge of CSD's Training Division, Old Admiralty Building, Whitehall, London SW1A 2AZ.

Finding out about cassettes

One of the difficulties of buying spoken audio cassettes is to find out what is available. There is no United Kingdom systematic discography: that is to say, there is no regular, comprehensive listing. There are a few published catalogues of educational audio-visual material, but these tend to concentrate on slides, wallcharts and films; they include few audio cassettes and of these even fewer are of interest to the businessman. Management tapes are not reviewed comprehensively in the professional or trade press. *The Gramophone* and its 'Spoken Word and Miscellaneous Catalogue' limits itself to recreational-type cassettes. There is no statutory deposit under the Copyright Act. They are not listed by the British Library, nor collected by the British Institute of Recorded Sound. It is, therefore, by pure serendipity that one discovers the existence of the type of cassette mentioned in this article.

The author regrets the omission of any relevant items; such lacunae, however, illustrate the problems of identification. She would be pleased to receive information from publishers. Those who are interested in collecting business audio cassettes may care to know that the CSD library has produced a short catalogue of the tapes in its collection. Copies of the list may be obtained by writing to the Librarian, Civil

Service Department, Old Admiralty Building, Whitehall, London SW1A 2AZ, enclosing a stamped addressed envelope, size C4 or C5. It must, however, be emphasized that this is in no sense comprehensive but merely represents titles which happen to have been collected by one library.

NOTE: *It is important that compact cassettes which are the subject of this article should not be confused with cartridges which, unlike cassettes, contain a continuous loop of tape and hence are most often seen as music for in-car entertainment. Cassettes are less bulky than cartridges, have a narrower tape width and run at a lower speed. Cassettes cannot be played on a cartridge player, and vice versa.*

Management Services handbooks

Readers may like to be reminded of the titles that are available in the Management Services Handbook series, published by CSD Management Services. They are:

E.125 *Typing services* (44 pages, price 45p)
E.130 *Forms control* (38 pages, price 60p)
E.132 *Centralized dictation systems* (25 pages, price 45p)
E.133 *Transport management* (32 pages, price 55p)
E.134 *Microcopying systems* (55 pages, price £1·30)
E.136 *Management accounting in the Civil Service* (76 pages, price £1·10)
E.137 *Glossary of accounting terms* (28 pages)

Also available:

E.131 *Guide for new managers* (36 pages, price 55p)

Departments may obtain copies from Her Majesty's Stationery Office through their normal departmental publications demand channels. Persons and organizations outside the Civil Service may obtain copies from Civil Service Department (MSSU), Room 2/100 Old Admiralty Building, Whitehall, London SW1A 2AZ. Orders must be accompanied by a cheque or postal order, made payable to 'Civil Service Department'. The prices quoted above include postage (within UK).

A Handbook of Personnel Management Practice—A Review

Books are expensive these days and at £12·00 *A Handbook of Personnel Management Practice* by Michael Armstrong, published by Kogan Page, is certainly no exception. Yet, one improvement in personnel management practice, one industrial dispute prevented, one measure to save injury or death at work introduced as a result of dipping into the Handbook cannot fail in terms of production, efficiency or human distress to repay many times the outlay on the Handbook. Of course, one cannot cost directly the effectiveness of all areas of personnel management and I would not suggest that a reading of the book will bring instant recognition of a reader as an experienced personnel manager. Nevertheless, the book brings together and codifies in a logical way a wealth of experience in practical terms which would serve to supplement or refresh the experience of most personnel managers.

The Handbook is clearly intended for a wide audience in both the public and private sectors. The Civil Service reader will, therefore, have to temper the techniques and practices described to suit the environment in which he operates. Some of the chapters in the book will be of little direct relevance to the manager in the Civil Service. For example, most Civil Service managers will have little say in the formulation of wage payment systems or redundancy schemes. However, it is undoubtedly valuable for every manager to appreciate the underlying philosophies of areas over which he has no direct influence, but which may condition the problems he does face and can influence, and which will certainly affect the attitudes of the staff with whom he deals. The book aims to present an integrated picture of personnel management as a vital function which concerns all management—not just the Personnel Manager. Each of the constituent parts of personnel management (and, therefore, the constituent parts of the book) is related to the need of the organization as a whole to achieve its purpose. Its basis is that every manager is involved in obtaining, organizing, motivating and interacting with the human resources he controls and that the Personnel Department is there to provide management with advice and services on matters relating to manpower planning, recruitment, employment, training, management development, motivation, pay and employee relations.

The book is divided into six parts:

(1) *The Basis of Personnel Management* in which personnel management is defined and analysed into the areas which comprise the remaining five parts of the book, the nature of personnel strategies and policies is discussed, and the role of the personnel function is examined.

(2) *Organization* in which the organizational aspects of personnel management—its organization design and development—are dealt

with in some detail on the grounds that they form the context within which all other aspects of personnel management function.

(3) *Manpower* which covers all those aspects of human resource management concerned with obtaining, employing and developing the number and quality of people required by the organization: namely, manpower planning, recruitment, employment, training and management development.

(4) *Motivation* which explores the different approaches to motivating and remunerating people, including job design, job enrichment, payment systems and job evaluation.

(5) *Employee Relations* which starts with an analysis of industrial relations principles before dealing with employee relations practice in the form of industrial relations procedures, consultation, participation and communications.

(6) *Employee and Personnel Services* which first considers the two main areas of employee services provided by organizations: namely, health and safety, and welfare, and then deals with personnel records and information systems.

The credentials of Michael Armstrong, the author, are impressive: a London School of Economics graduate with personnel management experience in the food and engineering industries, one-time Head of the Organization and Personnel Division of Coopers & Lybrand Associates and a Director of Book Club Associates with responsibility for administration and personnel management matters. His approach is basic and thorough. Principles and techniques are clearly and logically explained and presented. There are helpful and comprehensive check lists at the end of most chapters. But I did not perceive any bright and fresh insights into old problems. Its thoroughness and disciplined approach to each topic made for uninspiring and fairly humourless reading. Whilst the book is comprehensive in its coverage and takes the trouble to set out basics which the unwary might easily overlook, a book of 400 pages cannot give the depth to each of its topics that some readers may seek. For example, a reader setting up a job evaluation scheme or a job redesign programme solely on the basis of Michael Armstrong's book could easily come unstuck—and the references he gives to other works are limited.

All in all, the book is an expensive but sound addition to the personnel manager's bookshelf. Its greatest value is probably as a textbook supplementing formal training for line managers.

D. W. R.

Letters to the Editor

The views expressed in Letters to the Editor are the writers' own, and not necessarily those of their departments.

SEO/Principal—What's in a Name?

Dear Editor,
Mr. McGhee's article which appeared in your August 1977 edition is both informative and thought provoking.

In identifying a growing imbalance of numbers as between Principals and SEOs perhaps he has stumbled upon the fact that currently it is the job process which must increasingly determine the structure of the organization. At the middle management level contemplated, I suggest that the core characteristic demanding Principal grading is decision-making of a kind involving assessment, judgement, uncertainty and risk. Such decisions cannot be right or wrong, but only more or less effective in the circumstances. It is this kind of decision-making which is increasingly required of line managers in these days of rapid and unexpected change and growing complexity. Perhaps the lesser incidence of this kind of decision-making in staff jobs leads to these being preponderantly SEO?

Mr. McGhee sees the consequential flattening of the traditional job structure pyramid as leading to career development (or is it rather promotion?) problems for SEOs. Perhaps more effectively orientated in-Service or self-training programmes might help SEOs in this respect. Also, why not consider multiple SEOs working to a single Principal?

Or is there, perhaps, a wider problem? Could it be that in many 'policy' departments the SEO grade in line management is now an anachronism which should be abolished, thus freeing its job factor content and salary band for reshaping of an improved HEO grade to take weightier discrete decisions and an improved EO grade to provide positive support?

Yours sincerely,

J. BLAIKIE
Department of Agriculture
and Fisheries for Scotland

Job descriptions

Dear Editor,
Not to detract in any way from the seriousness of the journal I proffer the following by way of some light relief.

To set the scene, my previous job with the Ministry of Defence Air Force Department was concerned with the very serious task of design and implementation of productivity payments schemes in an equipment supply depot.

At an early stage the team leaders, myself included, were asked by the Unit MS Officer to produce an agreed job description. This we duly constructed, but, as with most working groups, we had our 'comic' who insisted on adding his own personal interpretation of each job element. The result of this corporate exercise follows:

Present job
MS Officer employed on the design and implementation of productivity payments schemes.

Job description

1. Initial survey of sections, planning detailed course of action, recording, charting and critical analysis of present work methods and work output.
   Means—Wander round shed
2. The measurement of work by time study, rated activity sampling, synthetics, PMTS (MMD) and other techniques.
   Means—Send workers' representative to time work
3. Consultation and negotiation with management and trade union representatives.
   Means—Drinks in mess, or tea in canteen
4. Analysis of derived times for use in conjunction with work output to establish manning requirements under incentive conditions.
   Means—Sort out what on earth it all means and come up with a good answer
5. Design and documentation of incentive schemes followed by the compilation of the productivity payments schemes reports (for management), Work Specification Part 2 (negotiation document) and Study Set-up (technical document).
   Means—Stay in office and do crossword
6. Conducting trials of new methods.
   Means—Ask foreman how it is going
7. Installation and monitoring of schemes.
   Means—Ask foreman if it has started or stopped
8. Advice and assistance to management as required on other related matters.
   Means—Assuring the station commander that it will never happen

Yours sincerely,

A. LANE
Civil Service Department

Professional computer training

Dear Editor,
One way of ensuring an adequate number of qualified computer specialists is to encourage suitable computer people to study for the British Computer Society examinations.

Your Civil Service readers may wish to know that a Central Training Notice was recently issued by the Civil Service College, which described the range of courses available from September 1978 at the London Centre of the College and at North Staffordshire Polytechnic to prepare candidates for Parts 1 and 2 of the BCS examinations. (Particulars of courses currently running are described in the booklet *ADP Training Courses, 1977–78*, which is available from the College.)

These courses are of a 'sandwich' nature at the College and both 'sandwich' and full-time at North Staffordshire Polytechnic—thus offering a choice of training schemes to suit a variety of needs.

Line managers are invited to select candidates for these courses as part of regular career development and in so doing are asked to try to ensure that adequate time off is allowed for studies and associated work required to be done as part of the training —about two days a month for five months are required, on average, by students attending the 'sandwich' training. It is also important for students to be employed wherever possible on work relevant to their studies since good practical experience is required to complement theoretical knowledge.

The Central Computer Agency has also issued a notice drawing attention to other training opportunities which lead to BCS Parts 1 and 2 examinations. Such opportunities are available at, for example: The City University; Defence ADP Training Centre, Blandford; London School of Economics; Royal Military College of Science, Shrivenham; and some polytechnics.

In passing, your readers may also like to know that, for the 1977 BCS Part 1 examination, the Civil Service College entered 50 students and obtained a pass rate of 86 per cent, which is about double the national rate for students who sat the whole examination.

Readers who would like further information about the courses are invited to contact me at the Civil Service College (telephone 01-834 6644, extension 324).

Yours sincerely,

C. E. PORT
Course Director,
Civil Service College

Office machines demonstration rooms

Dear Editor,
Your November 1977 edition carries the sad news that the office machines demonstration rooms in Old Admiralty Building have been closed—although some of the machines have been transferred to the Civil Service College in Belgrave Road.

Your readers may wish to note that there is a selection of office machines, office aids and microfilm equipment on display in a demonstration room maintained by the Scottish Office Management Services Unit at James Craig Walk, Edinburgh. This facility is used mainly by Scottish Office staff but visitors from other government departments and associated bodies are welcome provided they give advance notice.

Anyone who wishes to see the machines or to find out what is on display should contact Mr. G. I. McCran on 031-556 8400, extension 4513.

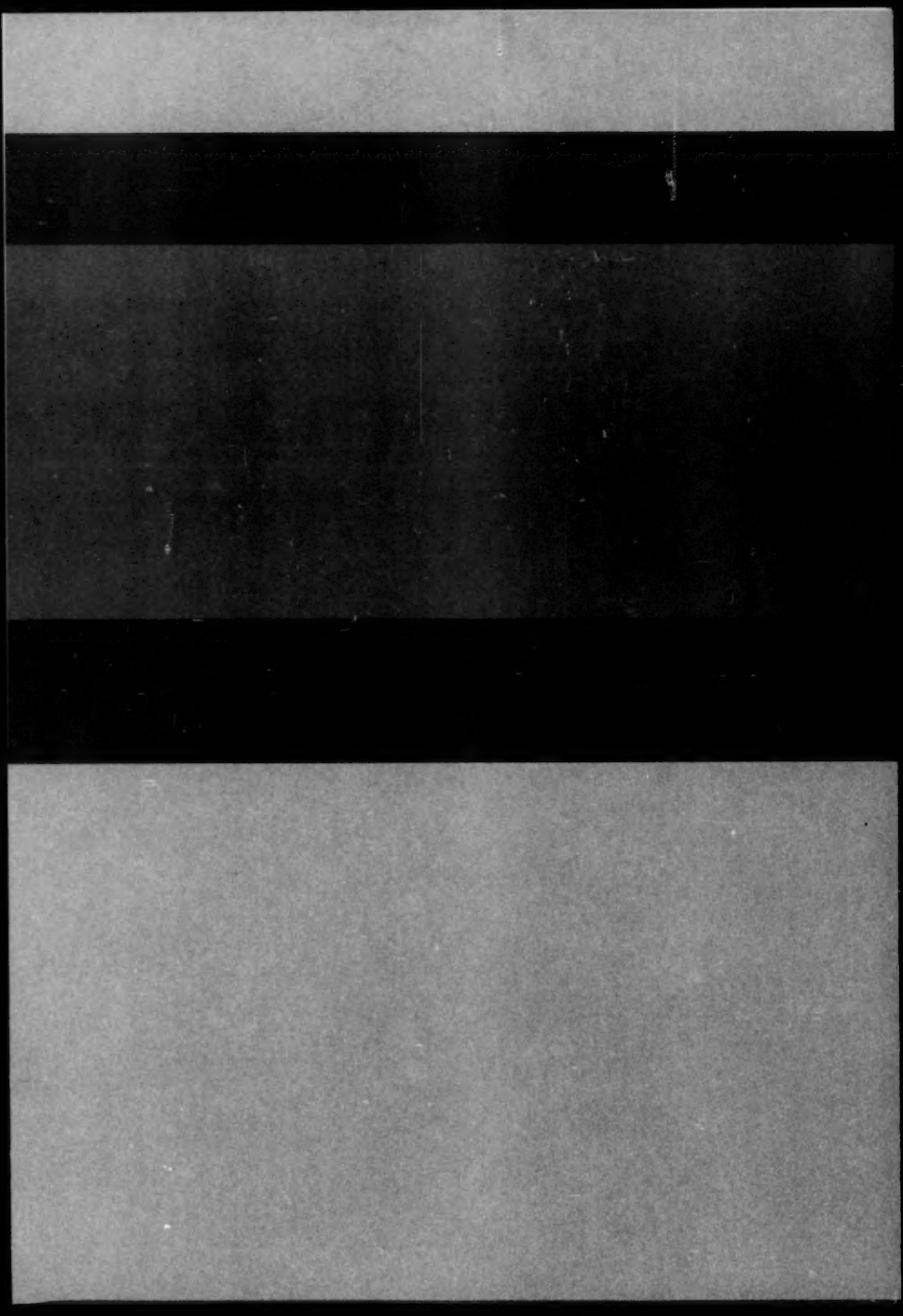
Yours sincerely,

J. PETTIGREW
Scottish Office

Computer Installations for Government Departments

A list of all Government computers as at 1st January 1977 was published as a supplement to the May 1977 edition of MANAGEMENT SERVICES IN GOVERNMENT. Details of computers ordered during the period 1st July to 30th September 1977 are shown in the following table.

DATE OF ORDER	DEPARTMENT[1]	LOCATION	MAIN USES	MANUFACTURER[2] AND TYPE OF COMPUTER
1B Computers on order for administrative and general purposes				
July 1977	MOD (Army)	Bicester	Stock control	ICL 1904S
July 1977	MOD (Army)	Chilwell	Stock control	ICL 2903
July 1977	MOD (PE)	Chorley	Royal Ordnance Factories Bureau	ICL 1903T and EDS 60
September 1977	DOE	Hastings	Payroll	ICL 1904S
September 1977	DTp	Hemel Hempstead	Road accident statistics	ICL 2903 and 2 × F1558/00 Interfaces
2B Computers on order for scientific and technical purposes				
July 1977	MOD (Navy)	Alverstoke	Environmental Medicine Unit	DG Eclipse S/230
July 1977	MOD (PE)	Bedford	Graphics output	Tektronix 4051
July 1977	CSD	London	Teaching system programming for BCS courses	DEC PDP11/34
August 1977	CSD	London	Microprocessor workshop	DEC 11F34 AB
August 1977	MOD (PE)	Farnborough	General scientific computing	DG Eclipse S230
August 1977	MOD (PE)	Porton Down	General scientific computing	SEL 32/35
August 1977	DoI	Warren Spring	General scientific computing	ICL 1902T
August 1977	DoI	Teddington	Acoustics research	Prime 300
September 1977	MOD (PE)	Greenwich	Simulation	EAL 600/32 (Hybrid)
September 1977	MOD (Air)	Upavon	Aircraft, troops and stores logistical deployment	ICL 2903
September 1977	Home Office	London	Development of command and control systems	GEC 4070
September 1977	MOD (PE)	Chertsey	Disc storage	ICL EDS60

[1, 2] Refer to supplement to May edition for Department and Manufacturer keys. Abbreviations for the following manufacturers are included for the first time: Tektronix—Tektronix (UK) Ltd; SEL—Systems Engineering Laboratories; EAL—Electronic Associates Ltd.

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